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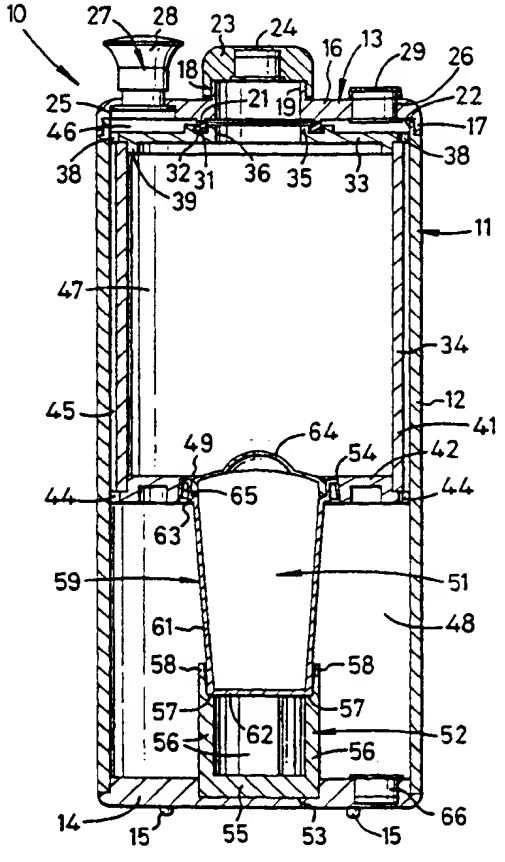
(54) Title: A FILTERED WATER DRINKING BOTTLE



(57) Abstract: A filtered water drinking bottle (10) includes a hollow tubular casing (11) with a mouth which is normally closed by a lid (13) which carries a drinking spout (27). The interior of the casing (11) is divided into two chambers (47 and 48) having similar volumes. A water filter cartridge (51) is positively located between the base (14) of the casing (11) and a disc (42) which separates the two chambers (47 and 48) so that it is spaced from the mouth. One end of the filter cartridge (51) is seated in an aperture (49) in the disc (42). The chamber (47) communicates with the mouth and the chamber (48) communicates with the spout (27). The two chambers (47 and 48) only communicate with each other through the water filter cartridge (51). The bottle (10) is filled through the mouth with the lid (13) removed.

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A FILTERED WATER DRINKING BOTTLE

This invention relates to filtered water drinking bottles and more particularly to a filtered water drinking bottle of the kind which includes a hollow vessel with a closure which can be removed to uncover an opening and thereby to enable the vessel to be charged with water, means operable to support filter media within the vessel whereby water with which the vessel is charged is filtered and a manually openable and closable spout through which filtered water can be drunk from within the vessel when the spout is opened and the closure is fitted to otherwise close the interior of the vessel in a watertight manner. Such a filtered water drinking bottle is identified as "a filtered water drinking bottle of the kind referred to" in the following description.

US-A-5,609,759 discloses a filter assembly for use with a plastic bottle. The filter assembly includes a liquid porous tube of filtering material, such as activated carbon with a plastic binder, which is connected by one end to one surface of a cap for the bottle while a valve extends from an opposite surface of the cap. The valve is in communication with the interior of the tube through said one end. The other end of the tube is closed. A user fills the bottle with tap water, screws the cap onto the open neck of the bottle so that the tubular filter assembly depends from the cap into the bottle, and squeezes the bottle so that water is urged through the filter material into the interior of the tube from where it can be drunk by sucking through the valve. The amount of filtered water that is available to be drunk at any one time is limited to the volume of the interior of the tube which in turn is small because the

outside diameter of the tube is limited by the diameter of the mouth of the bottle into which it has to be inserted. Further it is desirable for tap water to dwell for some time in contact with the filtering material for there to be a really effective filtering action. Hence the rate of replenishment of filtered water in the interior of the tube has to be slow. Otherwise, if water is forced through the filtering material too quickly, there would be a risk that the replacement water would not be filtered to the required quality. US-A-5 840 185 and US-A- 5 919 365 disclose similar filtered water drinking bottles which support the filter media in the region of the mouth of the vessel. WO96/38382 discloses a similar, but somewhat larger filtered water dispenser in which the filter media is supported in the region of the mouth of the storage vessel.

An object of this invention is to increase the volume of water that is filtered to the desired quality and that is available for drinking from a filtered water drinking bottle at any one time as compared to the amount that is available for drinking from within a tubular filter that depends from the cap of a squeezy water bottle as described above.

According to this invention there is provided a filtered water drinking bottle of the kind referred to above, in which the vessel includes a casing having a mouth and a closed end, the closure being releasably securable to the casing to close the mouth in a water tight manner and carrying the spout, wherein dividing means are provided which divide the interior of the vessel into two volumes, the dividing means being adapted to support and positively locate water filter media in a location within the interior of the vessel which is

spaced from the mouth and from the closed end of the casing, the dividing means being arranged so that, when water filter media is fitted therein, flow of water from one volume to the other is constrained to pass through the filter media which restricts that flow and filters the water, one of the volumes being in communication with said opening and the other being in communication with the spout, the two volumes being sealed against water flow therebetween except through the filter media when the latter is fitted.

The invention also includes a filtered water drinking bottle including a hollow vessel with a closure which can be removed to enable the vessel to be charged with water to be filtered, means operable to support filter media within the vessel whereby said water with which the vessel is charged is filtered and a manually openable and closable spout through which filtered water can be drunk from within the vessel when the spout is opened and the closure is fitted to otherwise close the interior of the vessel in a watertight manner, the vessel including a casing having a mouth and a closed end, the closure being releasably securable to the casing to close the mouth in a watertight manner, and carrying the spout, characterised by dividing means which divide the interior of the vessel into two volumes the dividing means being adapted to support and positively locate the filter media in a location within the interior of the vessel which is spaced from the mouth and from the closed end of the casing, the dividing means being arranged so that, when the filter media is fitted therein, flow of water from one volume to the other is constrained to pass through the filter media which restricts that flow and filters the water, said one of the volumes being in

communication with said opening and the other being in communication with the spout, the two volumes being sealed against water flow therebetween except through the filter media when the latter is fitted.

Preferably air venting means are provided for each volume, each said air venting means being watertight having regard to the pressure of water in the respective volume.

Conveniently the dividing means is adapted to support and positively locate the water filter media by supporting and positively locating a water filter cartridge which is an aperture casing with the water filter media enclosed therein.

Preferably the dividing means forms an aperture and a seat for the water filter cartridge, the seat extending around the periphery of the aperture, the seat being configured so that the structure around the apertured inhibits passage of the water filter cartridge into the one volume that can be charged with unfiltered water when the closure is removed, whilst allowing the water filter cartridge to be seated therein with its inlet in communication with said one volume, and there being further support means in the other volume which provides a seat for the other end of the filter cartridge when the filter cartridge is seated in the aperture, the arrangement being such that the filter cartridge is positively located spatially within the vessel by being seated at either end in the respective seats formed around the aperture and in the other volume so that the water filter cartridge is constrained against displacement relative to the structure of the vessel.

Preferably the two volumes are of a similar order of magnitude. The vessel may be a cup-shaped casing with

a lid which is releasably secured to the casing to close the mouth of the cup-shaped casing in a water tight manner, the lid carrying the spout and being formed with the opening for filing the vessel with water to be filtered. It is possible to enclose the filter media in a perforated cartridge and to positively locate that cartridge within the vessel so that the flow of water from said one volume to the other is through the cartridge. By mounting the spout on the lid and forming the opening within the lid, a cartridge which is too large to be passed through the opening can be used, that cartridge being replaceable through the open mouth of the vessel when the lid is removed.

If the vessel has the shape of a conventional drinking bottle with a neck which forms the opening, such a filter cartridge which is too large to pass through the neck which forms the opening, can be replaced through the base of the vessel if the base is formed as a separate element which is releasably securable to the casing to close the base of the casing of the vessel in a water tight manner.

If the filtered water drinking bottle has the shape of a conventional bottle with a neck which forms the opening and the water filter media is supported spaced from the opening, there is the problem of how to conduct filtered water to the spout mounted on the cap that closes the opening formed by the neck of the bottle whilst allowing unfiltered tap water to be introduced through the opening when the cap is removed, without the filtered water conduit being contaminated by the unfiltered water.

The hollow vessel of one embodiment of this invention has a neck portion joined to a main body

portion by a shoulder portion, the neck portion forming a mouth which has a smaller cross-sectional area than does the main body portion, the closure being a cap which is adapted to be fitted to the neck portion to close the mouth and which can be removed to enable the vessel to be charged with water, the closure cap carrying the manually openable and closeable spout through which filtered water can be drunk from within the vessel when the spout is opened and the closure cap is fitted to otherwise close the interior of the vessel in a water-tight manner, wherein the dividing means form a tubular conduit which has one end portion which cooperates with the neck and shoulder portions to form an annular region of the interior of the vessel around said one end portion and within the neck and shoulder portions, the interior of the tubular conduit being part of said other volume, valve means being provided for said one end portion of the tubular conduit, said valve means being operably associated with the closure cap whereby the interior of the tubular conduit is closed to ingress of water from said annular region when the closure cap is removed and the vessel is charged with water through the mouth into said annular region and open when the closure cap is fitted to said neck portion, the remainder of the structure of the spout including a tubular portion which is fixed with respect to the closure cap and which projects into the mouth of the bottle when the closure cap is fitted to the neck portion, the tubular portion and the tubular conduit being arranged so that, when the closure cap is fitted to the neck portion to close the mouth, the tubular conduit is in water-tight sealing engagement with the tubular portion so that the interior of the tubular conduit is placed in communication with

the interior of the tubular portion for flow therethrough of water that has been filtered by passage through said water filter media. The spout may include an annular member which is reciprocable manually with respect to the remainder of the structure of the spout between one position in which the spout is open and another position in which the spout is closed in a water-tight manner.

Preferably said one end portion of the tubular conduit forms a seat for a valve member which is resiliently biassed to seat and close the interior of the tubular conduit and said remainder of the structure of the spout further includes a probe within the tubular portion, the probe being adapted to unseat the valve member when the closure cap is fitted to the neck portion.

Preferably said dividing means include a layer of elastomeric material which separates the interior of the tubular conduit in a water-tight manner from a first chamber which is part of said one volume and which is bounded by said filter media supported by said dividing means, first conduit means being provided which place said one chamber in communication with said annular region and second conduit means being provided which place the interior of the tubular conduit in communication with a second chamber which is separated from said first chamber by said filter media when the latter is supported by said dividing means, said first and second conduit means extending through said layer of elastomeric material which form a water-tight seal therearound. Conveniently said first conduit means traverse said tubular conduit.

Three forms of cylindrical filtered water drinking bottle in which this invention is embodied are described

now by way of example with reference to the accompanying drawings, of which :-

Figure 1 is a transverse section of one of the filtered water drinking bottles, the section being on a plane which includes the longitudinal axis of the bottle;

Figure 2 is a plan view of the lid of the bottle shown in Figure 1 with a filler cap removed for clarity;

Figures 3, 4 and 5 are plan views of internal details of the bottle shown in Figure 1;

Figure 6 is a plan view of another filtered water drinking bottle;

Figure 7 is a transverse section of the filtered water drinking bottle as shown in Figure 6, the section being on the line VII-VII in Figure 6;

Figure 8 is a transverse section of the filtered water drinking bottle shown in Figure 6, the section being on the line VIII-VIII in Figure 6;

Figure 9 is an enlarged view of a detail B shown in Figure 8;

Figure 10 is an underneath plan view of a modified form of the filtered water drinking bottle as shown in Figures 6 to 9; and

Figure 11 is a transverse section of a third form of filtered water drinking bottle, the section being on a plane which includes the longitudinal axis of the bottle, the drinking spout being shown in the closed condition.

Figure 1 shows the bottle (10) has a cylindrical casing (11). The casing is formed is of a tube (12) which is closed at one end by a lid (13) and at its other end by a base (14). The diameter of the tube (12) is such that it can be grasped by one hand. The external surface of the base (14) has four protuberances (15)

which serve as feet so that the bottle (10) can be stood on a surface with a longitudinal axis of the cylindrical casing (11) upright and the lid (13) at the top.

The lid (13) is an annular body (16) with a peripheral skirt (17) and a cylindrical boss (18) around its central aperture (19). The skirt (17) and the boss (18) project axially in opposite directions from the annular body (16). A circular protrusion (21) is formed on the same side of the lid (13) as the skirt (17). The protrusion (21) is co-axial with the skirt (17) and the central aperture (19) and is nearer to the latter than the former.

The lid (13) is screwed onto an externally rebated end portion (22) of the tube (12). A screw cap (23) is screwed onto the cylindrical boss (18). The screw cap (23) is fitted with an air vent (24).

Two holes (25 and 26) are formed through the lid (13) between the skirt (17) and the circular protrusion (21), one on either side of the central aperture (19). A known form of drinking spout (27) is fitted into one, (25), of the through holes. The drinking spout (27) has a valve element (28) which is displaceable manually in an axial direction between one position in which the spout (27) is closed in a water tight manner and another position in which the spout (27) is open so that a user who takes the spout (27) into his or her mouth can suck water through that spout. The other through hole (26) is fitted with an air vent (29).

The air vents (24 and 29) are press fit components which basically are a porus layer of polytetrafluoroethylene (PTFE) mounted on a structural carrier, the layer of PTFE having a pore size which is such as to allow air flow through it but which provides

sufficient resistance to water below a pressure of about 20 psi, for water within the bottle (10) to not seep through the air vent (24,29) since the pressure of water within the bottle (10) will always be too low.

The circular protrusion (21) seats on an 'O'-ring (31) which is fitted into an annular groove (32) which is formed in the external surface of one end wall (33) of a cylindrical drum (34). Figures 1 and 3 show that the end wall (33) is formed by an annular disc and that the annular groove (32) is formed in a cylindrical boss (35) which is formed around the central aperture (36) of that annular disc.

Figure 3 shows that the radially outer periphery of that annular disc forms eight arcuate recesses (37) which are each spaced from the juxtaposed pair of recesses (37) by a respective radial protuberance (38). A short cylindrical wall portion (39) is integral with and projects co-axially from the side of the annular disc opposite to the cylindrical boss (35). The radius of the inner edge of each of the arcuate recesses (37) exceeds the radius of the radially outer surface of the cylindrical wall portion (39) by about half the difference between the radii of the outer surfaces of each of the radial protuberances (38) and of the cylindrical wall portion (39).

The annular disc that forms the end wall (33) is fitted to one end of a tube (41) by spigotting the cylindrical wall portion (39) into the tube (41) at that end. The thickness of the wall of the tube (41) is such that the radial protuberances (38) project radially beyond its radially outer surface.

The other end wall of the drum (34) is formed by another annular disc (42). Figure 4 shows that the

annular disc (42) has a radially outer periphery which is similar to that of the annular disc that forms the end wall (33), in that it comprises eight arcuate recesses (43), each separated from the adjacent arcuate recesses (43) by a respective radial protuberance (44), the arcuate recesses (43) and the radial protuberances (44) being geometrically similar to the arcuate recesses (37) and radial protuberances (38).

The radii of the radially outer surfaces of the radial protuberances (38 and 44) are such that they are a loose fit within the tube (12). Hence the drum (34) is fitted into the interior of the cylindrical casing (11) with an annular space (45) therebetween. The annular space (45) is in communication with an annular space (46) which is formed between the end wall (33) and the lid (13) within the rebated end portion (22) of the tube (12) and around the 'O'-ring (31). The latter co-operates with the circular protrusion (21) to provide a seal between the annular space (46) and the coaxial central apertures (19 and 36) of the lid (13) and of the end wall (33).

Figure 1 shows that the air vent (29) vents the annular space (46) and that the inner end of the spout (27) is in communication with that annular space (46).

The annular disc (42) separates a compartment (47) that is formed by the interior of the drum (34) from the remainder of the interior of the cylindrical casing (11) that comprises the annular spaces (45 and 46) and the chamber (48) within the tube (12) between the annular disc (42) and the base (14).

The central aperture (49) of the annular disc (42) is formed as a seat for one end of a water filter cartridge (51). The other end of the water filter

cartridge (51) is seated in a seat member (52) which in turn is seated in a cylindrical recess (53) formed in the centre of the inner wall of the base (14). The central aperture (49) has a major portion which tapers from the end of that aperture (49) nearer to the base (14) for about 80% of the thickness of the annular disc (42), the remainder of the central aperture (49) being formed by a radially inwardly projecting annular flange portion (54) which is at the smaller diameter end of the tapered portion.

Figures 1 and 5 show that the seat member (52) is generally cup shaped having a circular base portion (55) which is seated in the cylindrical recess (53) and four arcuate wall portions (56) which project from the base portion (55) in a direction substantially parallel to the axis of the casing (11) and which are each angularly spaced from the pair of juxtaposed arcuate wall portions (56). Each arcuate wall portion (56) has an arcuate step portion (57) formed in its concave surface nearer to its end remote from the base (55), that step portion (57) being at the smaller diameter end of a tapered arcuate wall portion (58) which tapers from the brim of the respective arcuate wall portion (56) to the respective arcuate seat portion (57).

Figure 1 shows that the water filter cartridge (51) is a closed container comprising a cup-shaped major portion (59) having a circular side wall portion (61) which tapers from its brim to its base (62), that brim being formed by a stepped cylindrical portion (63) which forms a circular seat for a lid (64) which is spigotted therein to close the mouth of the cup-shaped portion (59). The cup-shaped portion (59) has a peripheral skirt (65) which is fixed to the brim portion (63) at its mouth

and which circumferentially surrounds the brim portion (63), the skirt portion (65) tapering from its end to the brim portion (63). The lid (64) is provided with slots or holes which serve as an inlet for water to flow from the compartment (47) within the drum (34) into the interior of the water filter cartridge (51). The tapered side wall (61) and the base (62) of the cup-shaped portion (59) of the water filter cartridge (51) are also formed with slots or holes to allow water to pass from within it into the chamber (48) that surrounds it. The water filter cartridge (51) contains water filter medium which typically includes granules of an absorbent material such as activated carbon. The slots or holes in the lid (64) and in the cup-shaped portion (59) are formed so as to be too small to allow the granules to be carried through by the flow of water therethrough.

By the seating of the skirt portion (65) at the larger diameter end of the cup-shaped portion (59) of the water filter cartridge (51) in the seat formed by the central aperture (49) of the annular disc (42), the radially inwardly directed flange portion (54) extending over the annular skirt portion (65) of the cup-shaped portion (59) of the filter cartridge (51), and by seating the base (62) of the cup-shaped portion (59) of the water filter cartridge (51) in the arcuate seats (57) formed by the seat member (52), the water filter cartridge (51) is located positively and spatially within the casing (11), that location restraining the water filter cartridge (51) from movement either axially with respect to the casing (11) or transversely thereof so that it is stable regardless of the orientation of the bottle (10).

A third air vent (66), similar to the air vents (24 and 29), is fitted into the base (14) of the casing (11)

to one side of the cylindrical recess (53).

The compartment (47) is vented by the air vent (24) when the screw cap (23) is fitted. Also the other compartment is vented by the air vents (29 and 66) which respectively communicate with the annular space (46) and the chamber (48).

A filtered water drinking bottle in which this invention is embodied could be formed with a rectangular planform rather than being cylindrical as shown in the drawings. The compartment for unfiltered water and the filter cartridge could be offset within such a rectangular casing.

The casing (11) that is closed by the lid (13) is a cup-shaped vessel and could be formed in one piece whereby it is closed at one end.

Figures 6 to 9 show another form of filtered water drinking bottle which is generally similar to that described above with reference to and as illustrated in Figures 1 to 5. Parts of the filtered water drinking bottle shown in Figures 6 to 9 which are similar to corresponding parts of the filtered water drinking bottle 10 described above with reference to and as shown in Figures 1 to 5 are identified in the following description by the reference character used in the description of Figures 1 to 5 with the addition of 100.

Figures 7 and 8 show that, like the bottle 10 shown in Figures 1 to 5, the bottle 110 has a generally tubular cup-shaped casing 111 which is closed at one end by a lid 113 and at its other end by a base 114 on which the bottle 110 stands. The bottle 110 is to contain a cylindrical drum 134 and a filter cartridge 151 which is seated on a seat member 152 with its upper end seated in a central aperture 149 of an annular disc portion 142

which is the underside of the cylindrical drum 134.

The casing 111, the base 114 and the seat member 152 are formed together as a one piece plastics moulding. The tubular portion of the casing 111 has an upper part 67 which extends over about a quarter of the overall axial length of the casing 111 and a lower part 68 which extends over the remainder of the axial length of the casing 111. The lower part 68 is generally cylindrical. In contrast the diameter of the upper part 67 diminishes progressively from its upper end which forms the brim onto which the lid 113 is screwed to its junction with the lower part 68. The diameter of the lower part 68 is such that it can be grasped by one hand.

The lid 113 has a crown portion 69 which has the form of an upturned saucer, and a peripheral skirt 117 with an internal screw thread 71. Six integral formations are formed on the crown portion 69. Two of those formations are co-axial axially extending annular projections 72 and 73 from the concave surface of the crown portion 69. The outermost annular projection 72 is formed adjacent to the junction of the crown portion 69 and the peripheral skirt 117 and has a frusto-conical radially outer peripheral surface 76 so that it tapers to its annular tip. The annular projection 73 has a diameter which is approximately half the diameter of the lid 113. Two other annular projections 74 and 75 from the concave surface of the crown portion 69 are formed side by side within the annular projection 73 and extend axially beyond it. Two holes 77 and 78 are formed in the crown portion 69, each within a respective one of the two annular projections 74 and 75. Each of two annular air vents 79 and 81 is pressed fitted into a respective one of the annular projections 74 and 75 so that it is

carried by the lid 113.

Figure 8 shows the other two projections 82 and 83 which are formed on the convex surface of the lid 113. These two projections 82 and 83 are symmetrically disposed either side of the longitudinal axis of the lid 113 and each has its own axis which is oblique to the axis of the lid 113, the angle included between its axis and the axis of the lid 113 being about 30°. The projection 82 is a cylindrical boss which surrounds an aperture 84 in the crown portion 69. A screw cap 85 is screwed onto the cylindrical boss 82. The screw cap 85 is fitted with an air vent 86.

The other projection 83 is a short post which cooperates with a strap 87 by a pin and slot connection to releasably retain the strap 87 to the lid 113. The strap 87 is formed integrally with the screw cap 85.

The air vents 79, 81 and 86 are press components which basically are similar in design and operation to the air vents 24, 29 and 66 described above.

The annular projection 73 is sized so as to be press fitted into the central aperture 88 of a domed annular closure member 89 when the lid 113 is screwed onto the open upper end of the casing 111 to close the bottle 110. The domed annular closure member 89 forms the upper end of the cylindrical drum 134. The remainder of the cylindrical drum 134, into which the domed annular closure member 89 is screwed, is a cup-shaped one-piece plastics moulding which has circumferentially-spaced radial protuberances 138 and 144. Like the casing 111, the side wall 90 of the cylindrical drum 134 has an upper part which is geometrically similar to the upper part 67 of the casing 111 and a lower part which is generally cylindrical. Like with the cylindrical drum 34, the

radial protuberences 138 and 144 are a loose fit within the casing 111. The arrangement is such that when the lid 113 is fitted onto the casing 111, the annular air vents 79 and 81 project into the interior of the drum 134 and a flow path passed the cylindrical drum 134 is formed within the casing 111.

Figure 9 shows five mating water tight sealing locations between the lid 113, the annular closure member 89, the mating side wall 90 of the cylindrical drum 134 into which the closure member 89 is snap fitted and the upper part 67 of the casing 111. These mating locations are indicated by a numbered star. The star 5 location is a seal between the brim 91 of the lid 113 and a rubber 'O'-ring 92 which is seated on an annular shoulder 93 formed on the outer surface of the casing 111. The shoulder 93 is spaced from the brim of the casing 111 by the externally threaded portion of the casing 111 that is engaged by the screwthread of the lid 113.Star 4 shows a face seal between the frusto-conical peripheral surface 76 and a mating frusto-conical surface 94 formed at the upper end of the brim of the casing 111. Star 1 indicates a face seal between the annular projection 73 and the central aperture 88 of the annular closure member 89. Star 2 indicates an annular face seal between the screw cap 85 and the mouth of the cylindrical boss 82. Star 3 indicates a seal formed between the annular closure member 89 and the side wall 90 by engagement of an annular portuberance 95 on the closure member 89 in a mating annular groove 96 formed in the inner surface of the side wall 90. These five water tight seals are formed when the lid 113 is fitted to the casing 111 and when the screw cap 85 is fitted onto the cylindrical boss 82.

The water filter cartridge 51, 151, is as is described and illustrated in our co-pending British patent application No. 9921713.5 filed 14 September 1999. As was the case with the filtered water drinking bottle described above and shown in Figures 1 to 5, by seating the skirt portion 165 that is formed at the larger diameter end of the cup shaped portion 159 of the water filter cartridge 151 in the seat formed by the central aperture 149 of the annular disc portions 142 that forms the bottom of the cylindrical drum 134, and by seating the base 162 of the cup shaped portion 159 of the water filter cartridge 151 on the seat member 152, the water filter cartridge 151 is located positively spatially within the casing 111, that location restraining the water filter cartridge 151 from movement either axially with respect to the casing 111 or transversely thereafter so that it is stable regardless of the orientation of the bottle 110.

The compartment 147 within the cylindrical drum 134 is vented by the annular air vents 79 and 81 and the holes 77 and 78 when the lid 113 is fitted to the casing 111. Also the other compartment that surrounds the water filter cartridge 151 and the cylindrical drum 134 is vented by the air vent 86 when the screw cap 85 is fitted.

The lid 113 is unscrewed from the casing 111 to enable the bottle 110 to be charged with tap water which is introduced through the central aperture 88 at the upper end of the cylindrical drum 134. The lid 113 is refitted to close the bottle 110 when the drum 134 has been filled. A certain period of time sufficient to allow the water introduced into the drum 134 to be filtered by passage through the interior of the water

filter cartridge 151 and to collect in the other compartments must be allowed to pass before any water may be drunk. After the passage of that time, water may be drunk from the bottle 110 by unscrewing the screw cap 85 and removing it with the air vent 86 which is fitted in it. The water is drunk simply through the aperture 84 and the spout formed by the cylindrical boss 82. The retaining strap 87 ensures that the screw cap 85 is not lost.

The lower part 68 of the casing 111 could be rectangular rather than cylindrical as shown in Figure 10.

Figure 11 shows a bottle (210) which is a hollow vessel having a cylindrical neck portion (211) joined to one end of a cylindrical main body portion (212) by a curved, internally concave annular shoulder portion (213). A shallow cup-shaped disc (214) is screwed into the other end of the main body portion (212) to close the vessel at that end. The vessel is substantially rigid. The neck portion (211) forms a mouth (215) which has a smaller cross-sectional area than does the main body portion (212) which is sized so that it can be grasped by one hand. A cup-shaped closure cap (216) of plastics material is screwed onto the neck portion (211) to close the mouth (215). The closure cap (216) carries a drinking spout (217). As is usual, the spout (217) includes a central stem portion (218) and an annular valve member (219). The stem portion (218) extends through a central hole in the base of the closure cap (216) and is fixed to the closure cap (216) by angularly spaced radial webs (not shown). The stem portion (218) projects from the base of the closure cap (216) in the opposite direction to the cylindrical side wall of the

closure cap (216). The annular valve member (219) surrounds the stem portion (218). It is guided by a tubular boss (220) for rectilinear movement in a reciprocal manner along the stem portion (218) between the one position, shown in Figure 11, where the stem portion (218) and the valve member (219) co-operate together to close the spout (217) in a water tight manner, and another position in which the spout (217) is open to allow water to flow through the central hole and between the stem portion (218) and the valve member (219), the end of the stem portion (218) outside the bottle (210) being flush with the end of the annular valve member (219). The stem portion (218) and the valve member (219) are formed of a plastics material. The tubular boss (220) is formed integrally with the closure cap (216).

The external surface of the base of the cup-shaped disc (214) has a rubber ring (221) embedded in a circular groove from which the ring (221) projects so that the bottle (210) can be stood on a surface on the ring (221) with a longitudinal axis of the vessel upright and the closure cap (216) at the top.

The closure cap (216) is fitted with an air vent (222) which is located to one side of the spout (217) so as to communicate with the mouth (215) when the closure cap (216) is fitted to the neck portion (211). A similar air vent (223) is fitted into the base of the cup-shaped disc (214). A third air vent (224) is fitted into the cylindrical main body portion (212) and is located nearer to the disc (214) than to the shoulder portion (213).

The air vents (222, 223 and 224) are press fit components which basically are similar in construction and operation to the air vents (24), (29) and (66) and

the air vents (79, 81 and 76) described above.

That part of the spout (217) that projects outwardly from the closure cap (216), when the closure cap (216) is fitted to the neck portion (211), is conventional. However, the stem portion (218), which conveniently is tubular, is extended to project substantially co-axially into the interior of the closure cap (216) to form a probe (225) which projects into the mouth (215) when the closure cap (216) is fitted to the neck portion (211). The probe (225) is within another tubular portion (226) of plastics material which projects from the base of the cup shaped closure cap (216) around the periphery of the central hole in that base and into the mouth (215) to a greater axial extent than does the probe (225). A small radially inwardly projecting annular flange (227) is formed at the end of the tubular portion (226) remote from the base of the cup shaped closure cap (216).

The interior of the bottle (210) is divided by dividing means into two volumes which are of a similar order of magnitude. The dividing means are formed by two plastics mouldings (228 and 229) and a disc (230) of elastomeric material.

The plastic moulding (228) is generally funnel-shaped. Its larger diameter end portion (231) is cylindrical and is a sliding fit in the bore of the cylindrical main body portion (212). The moulding (228) is located axially within the vessel by abutment of the larger diameter end portion (231) with angularly spaced projections (232) which project inwardly from the bore of the main body portion (212) between the end portion (231) and the shoulder portion (213).

The smaller diameter tubular portion (233) of the funnel-shaped moulding (228) extends axially within the

through the disc (230).

The portion of the annular moulding (229) that extends between the waist portion (246) and the end (247) forms a seat (249) for one end of a water filter cartridge (251). The other end of the water filter cartridge (251) is seated in a seat formed by four angularly spaced posts (252) which are upstanding from the disc (214). Hence the water filter cartridge (251) is positively located within the bottle (210) by the moulding (229) at one end and by the upstanding posts (252) at the other end. Further the annular moulding (229) is urged against the disc (230) of elastomeric material by a thrust imparted to it through the water filter cartridge (251), that thrust being exerted by the action of screwing the disc (214) into the end of the main body portion (212).

The water filter cartridge (251) is similar to the water filter cartridges (51) and (151) described above. The brim of the cup-shaped major portion (253) forms a circular seat for a lid (254) which is fitted thereon to close the mouth of the cup-shaped portion (253). The lid (254) has a peripheral skirt and a crown, the skirt tapering from the crown to its brim and being the portion of the water filter cartridge (251) that seats in the seat (249). The annular chamber (255) that surrounds the water filter cartridge (251) communicates through the conduits formed by the tubular portions (248) of the annular moulding (229) with the interior of the funnel-shaped moulding (228) which is bounded by the disc (230) of elastomeric material.

The annular chamber (242) that is in communication with the mouth (215) is vented by the air vent (222) when the closure cap (216) is fitted. Also the annular

chamber (255) that surrounds the water filter cartridge (251) and communicates with the interior of the funnel-shaped moulding (228) is vented by the air vents (223) and (224), the latter (224) being near to the flange (245). The volume that includes the interior of the funnel-shaped moulding (228) and that is bounded by the disc (230) of elastomeric material also includes the annular chamber (255) and the interiors of the tubular portions (248).

The disc (230) of elastomeric material provides appropriate water-tight seals around it and around the periphery of the tubular portions (241 and 248) of the mouldings (228 and 229) that project through it to form conduits through it. An O-ring (256) is seated in an annular groove formed in the outer surface of the larger diameter cylindrical portion (231) of the funnel-shaped moulding (228) to provide a water tight seal between the wall of the major cylindrical portion (212) and the funnel-shaped moulding (228).

A flexible skirt could be provided in place of the O-ring (256) to provide a water-tight seal against water passage between the main body portion (212) and the cylindrical portion (231). The disc (230) of elastomeric material could engage the inner wall of the main body portion (212) in a water-tight manner instead of the inner surface of the cylindrical

CLAIMS

1. A filtered water drinking bottle including a hollow vessel with a closure which can be removed to enable the vessel to be charged with water to be filtered, means operable to support filter media within the vessel whereby said water with which the vessel is charged is filtered and a manually openable and closable spout through which filtered water can be drunk from within the vessel when the spout is opened and the closure is fitted to otherwise close the interior of the vessel in a watertight manner, the vessel including a casing having a mouth and a closed end, the closure being releasably securable to the casing to close the mouth in a watertight manner, and carrying the spout, characterised by dividing means which divide the interior of the vessel into two volumes the dividing means being adapted to support and positively locate the filter media in a location within the interior of the vessel which is spaced from the mouth and from the closed end of the casing, the dividing means being arranged so that, when the filter media is fitted therein, flow of water from one volume to the other is constrained to pass through the filter media which restricts that flow and filters the water, said one of the volumes being in communication with said opening and the other being in communication with the spout, the two volumes being sealed against water flow therebetween except through the filter media when the latter is fitted.

2. A filtered water drinking bottle according to claim 1, wherein air venting means are provided for

each volume, each said air venting means being watertight having regard to the pressure of water in the respective volume.

3. A filtered water drinking bottle according to claim 1 or claim 2, wherein the dividing means is adapted to support and positively locate the filter media by supporting and positively locating a water filter cartridge which is an apertured casing with the filter media enclosed therein.

4. A filtered water drinking bottle according to claim 3, wherein the dividing means forms an aperture and a seat for the water filter cartridge, the seat extending around the periphery of the aperture, the seat being configured so that the structure around the aperture inhibits passage of the water filter cartridge into the one volume that can be charged with unfiltered water when the closure is removed, whilst allowing the water filter cartridge to be seated therein with its inlet in communication with said one volume, and there being further support means in the other volume which provides a seat for the other end of the filter cartridge when the filter cartridge is seated in the aperture, the arrangement being such that the filter cartridge is positively located spatially within the vessel by being seated at either end in the respective seats formed around the aperture and in the other volume so that the water filter cartridge is constrained against displacement relative to the structure of the vessel.

5. A filtered water drinking bottle according to any

one of claims 1 to 4, wherein the two volumes are of a similar order of magnitude.

6. A filtered water drinking bottle according to any one of claims 1 to 5, wherein the casing is cup-shaped.

7. A filtered water drinking bottle according to any one of claims 1 to 6, wherein the closure is a lid.

8. A filtered water drinking bottle according to any one of claims 1 to 7 wherein the filter media is enclosed in a perforated cartridge and that cartridge is positively located within the vessel so that the flow of water from said one volume to the other is through the cartridge.

9. A filtered water drinking bottle according to claim 8 when appended to any one of claims 1 to 6, wherein the vessel has the shape of a conventional drinking bottle with a neck which forms the opening and the base of the vessel is formed as a separate element which is releasably securable to the casing to close the base of the casing of the vessel in a water tight manner so that a filter cartridge which is too large to pass through the neck which forms the opening can be replaced through the base of the vessel.

10. A filtered water drinking bottle according to any one of claims 1 to 6 or claim 8 when appended to any one of claims 1 to 6, wherein the hollow vessel has a neck portion joined to a main body portion by a shoulder portion, the neck portion forming a mouth

which has a smaller cross-sectional area than does the main body portion, the closure being a cap which is adapted to be fitted to the neck portion to close the mouth and which can be removed to enable the vessel to be charged with water, the closure cap carrying the manually openable and closeable spout through which filtered water can be drunk from within the vessel when the spout is opened and the closure cap is fitted to otherwise close the interior of the vessel in a water-tight manner, wherein the dividing means form a tubular conduit which has one end portion which cooperates with the neck and shoulder portions to form an annular region of the interior of the vessel around said one end portion and within the neck and shoulder portions, the interior of the tubular conduit being part of said other volume, valve means being provided for said one end portion of the tubular conduit, said valve means being operably associated with the closure cap whereby the interior of the tubular conduit is closed to ingress of water from said annular region when the closure cap is removed and the vessel is charged with water through the mouth into said annular region and open when the closure cap is fitted to said neck portion, the remainder of the structure of the spout including a tubular portion which is fixed with respect to the closure cap and which projects into the mouth of the bottle when the closure cap is fitted to the neck portion, the tubular portion and the tubular conduit being arranged so that, when the closure cap is fitted to the neck portion to close the mouth, the tubular conduit is in water-tight sealing engagement with the tubular portion so that the interior of the tubular conduit is placed in communication with the

interior of the tubular portion for flow therethrough of water that has been filtered by passage through said water filter media.

11. A filtered water drinking bottle according to claim 10, wherein said one end portion of the tubular conduit forms a seat for a valve member which is resiliently biassed to seat and close the interior of the tubular conduit and said remainder of the structure of the spout further includes a probe within the tubular portion, the probe being adapted to unseat the valve member when the closure cap is fitted to the neck portion.

12. A filtered water drinking bottle according to claim 10 or claim 11, wherein said dividing means include a layer of elastomeric material which separates the interior of the tubular conduit in a water-tight manner from a first chamber which is part of said one volume and which is bounded by said filter media supported by said dividing means, first conduit means being provided which place said one chamber in communication with said annular region and second conduit means being provided which place the interior of the tubular conduit in communication with a second chamber which is separated from said one chamber by said filter media when the latter is supported by said dividing means, said first and second conduit means extending through said layer of elastomeric material which form a water-tight seal therearound.

13. A filtered water drinking bottle according to claim 12, wherein said first conduit means traverse

said tubular conduit.

14. A filtered water drinking bottle according to any one of claims 1 to 13, wherein the spout includes an annular member which is reciprocable manually with respect to the remainder of the structure of the spout between one position in which the spout is open and another position in which the spout is closed in a water-tight manner.

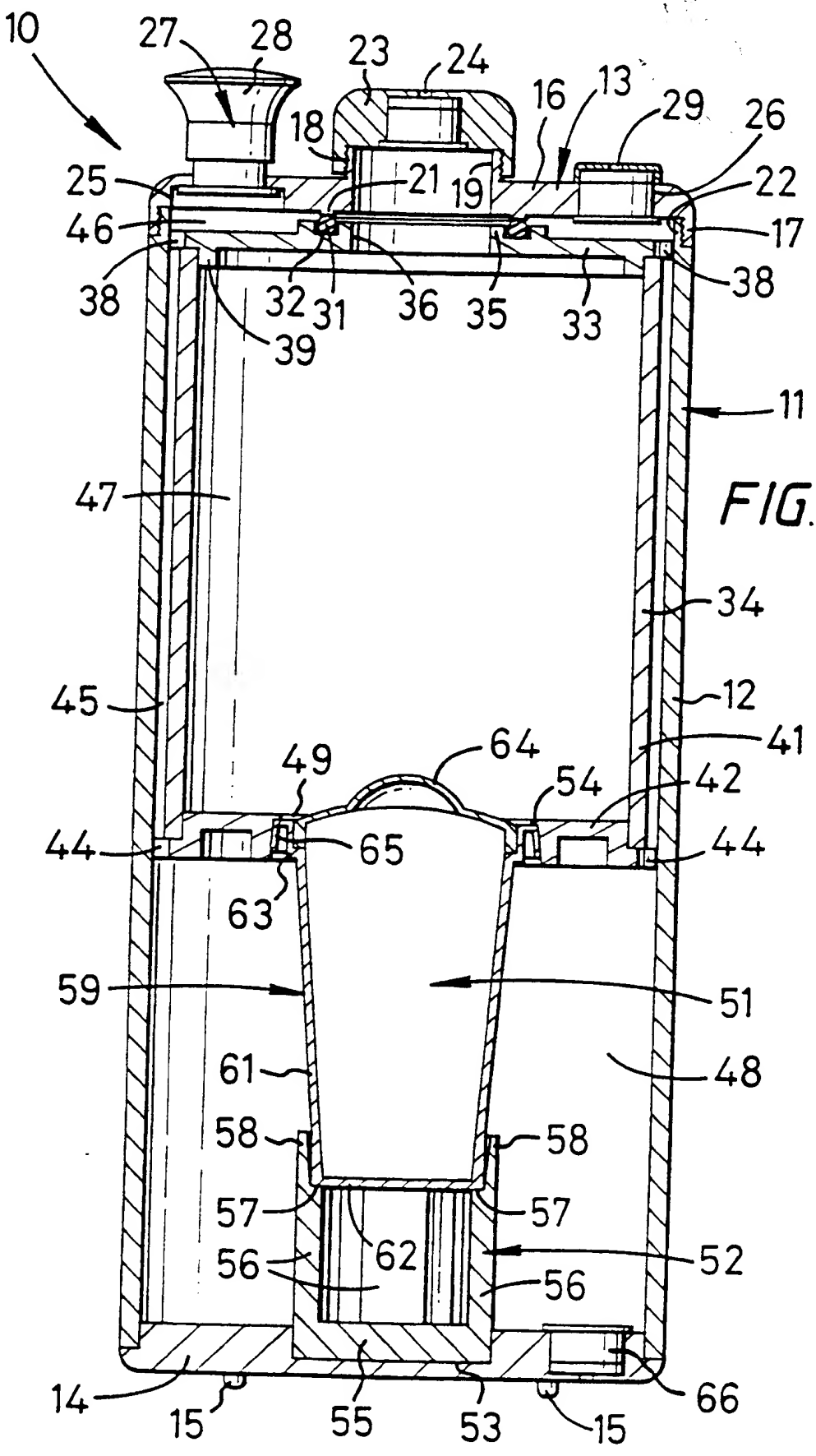
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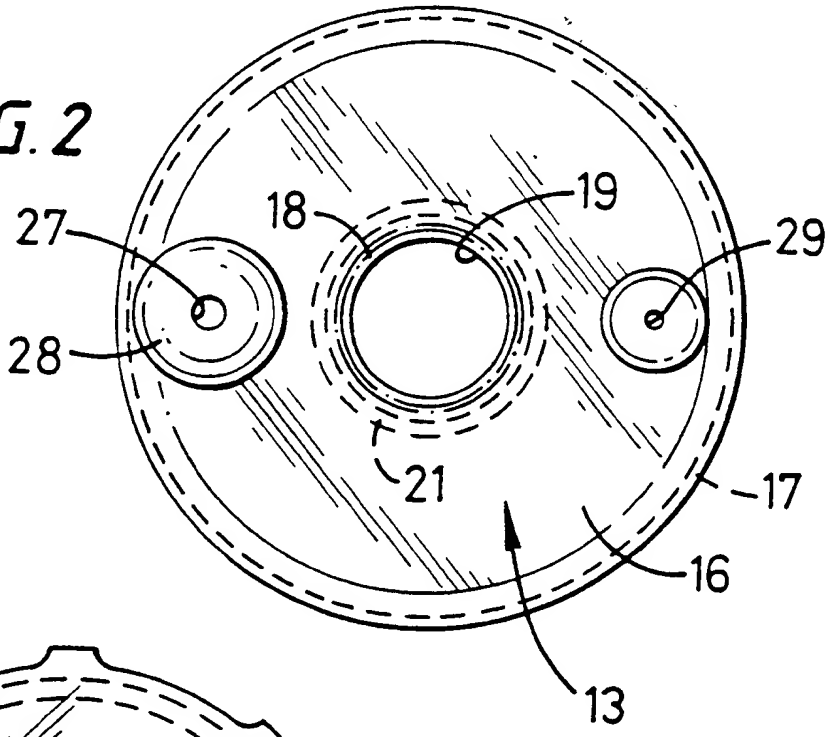
FIG. 1

FIG. 2



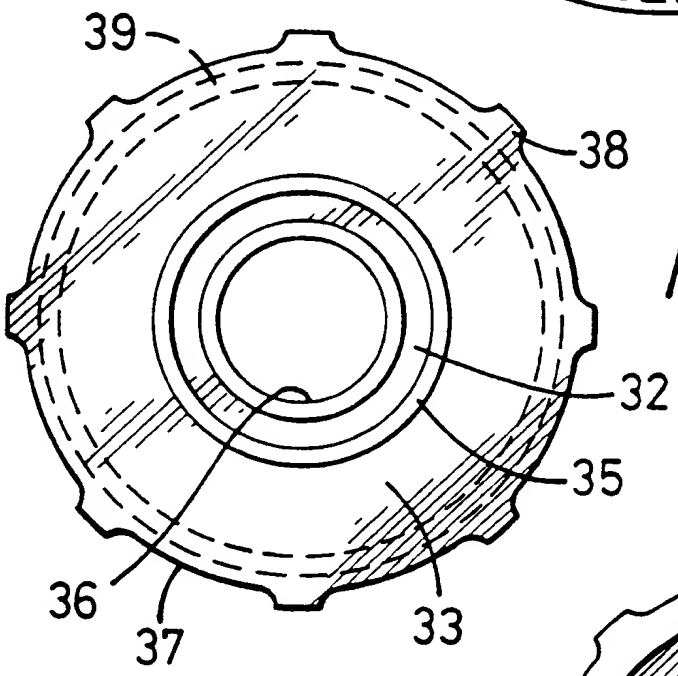
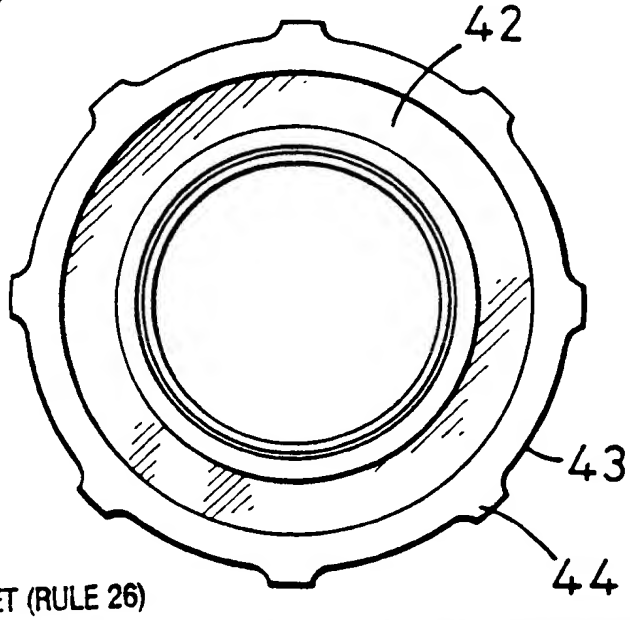


FIG. 3



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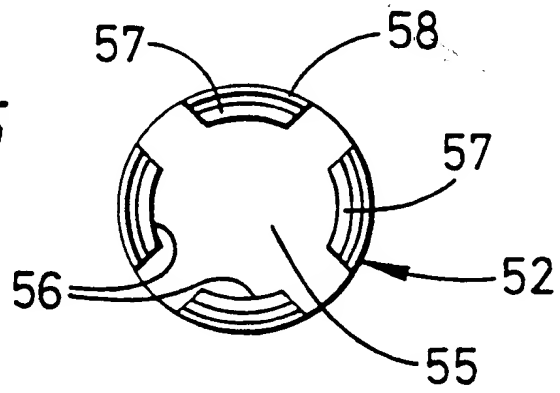


FIG. 5

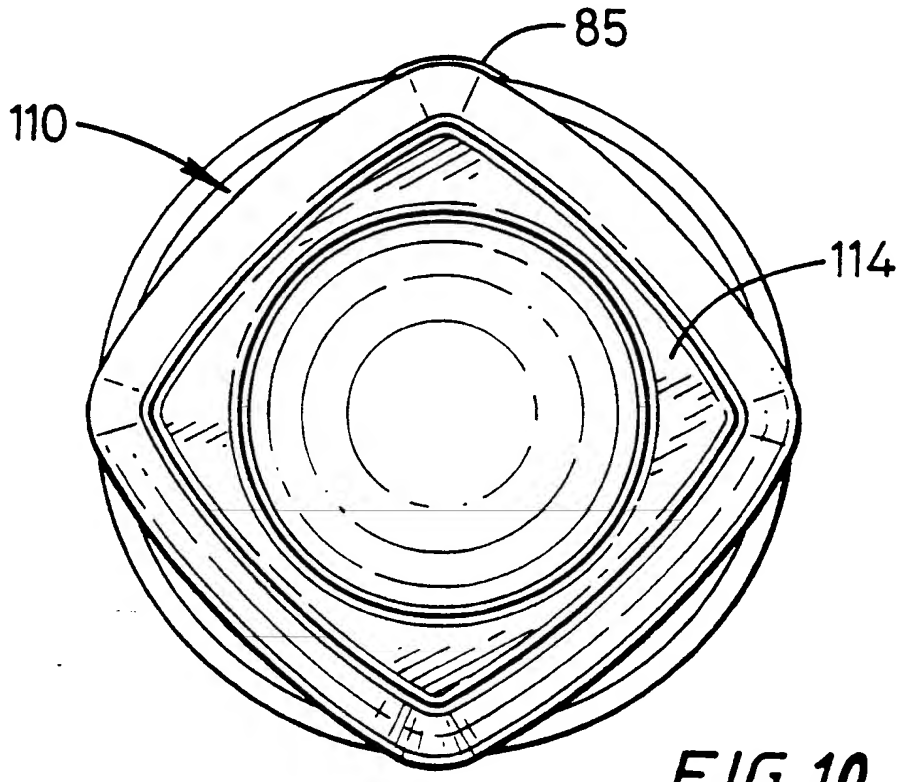
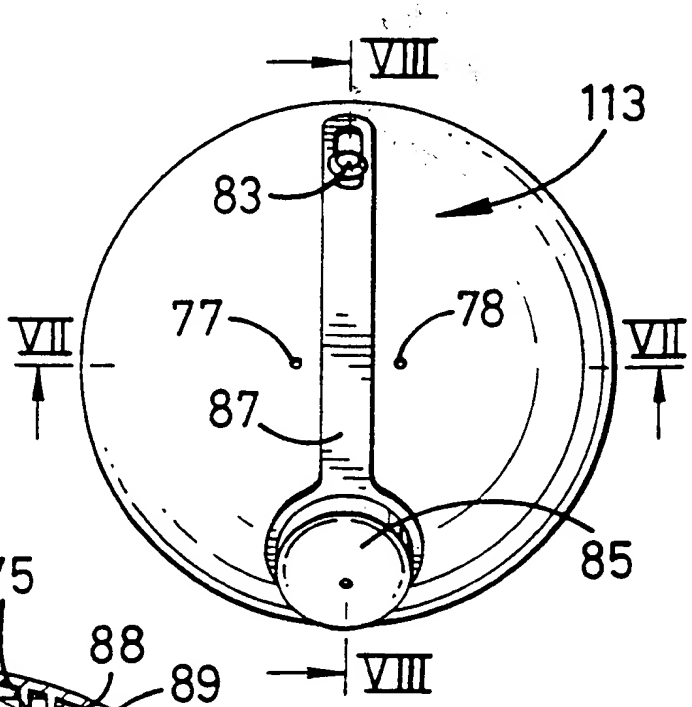


FIG. 10

FIG. 6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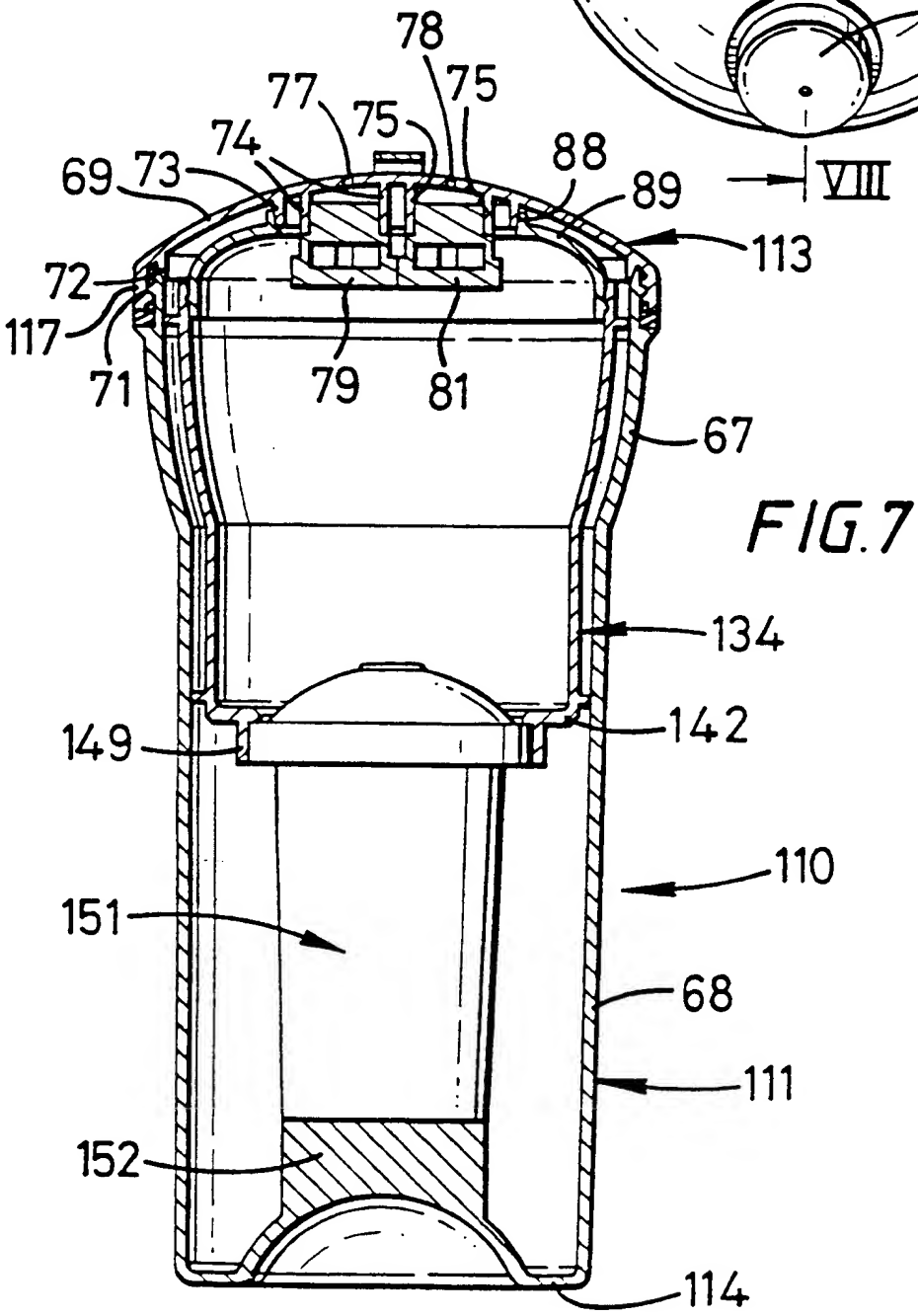
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FIG. 7

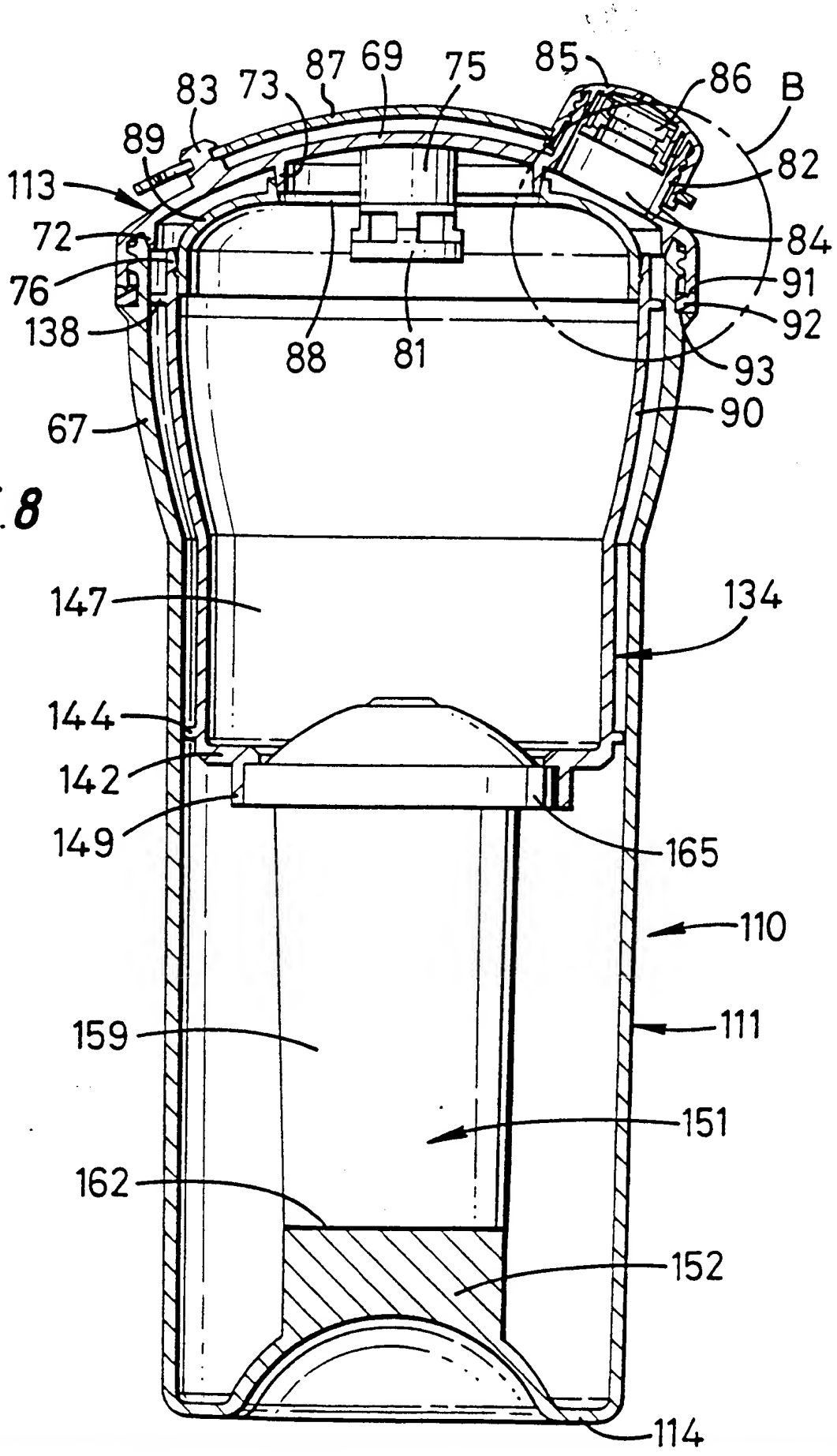
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FIG.8

FIG.9

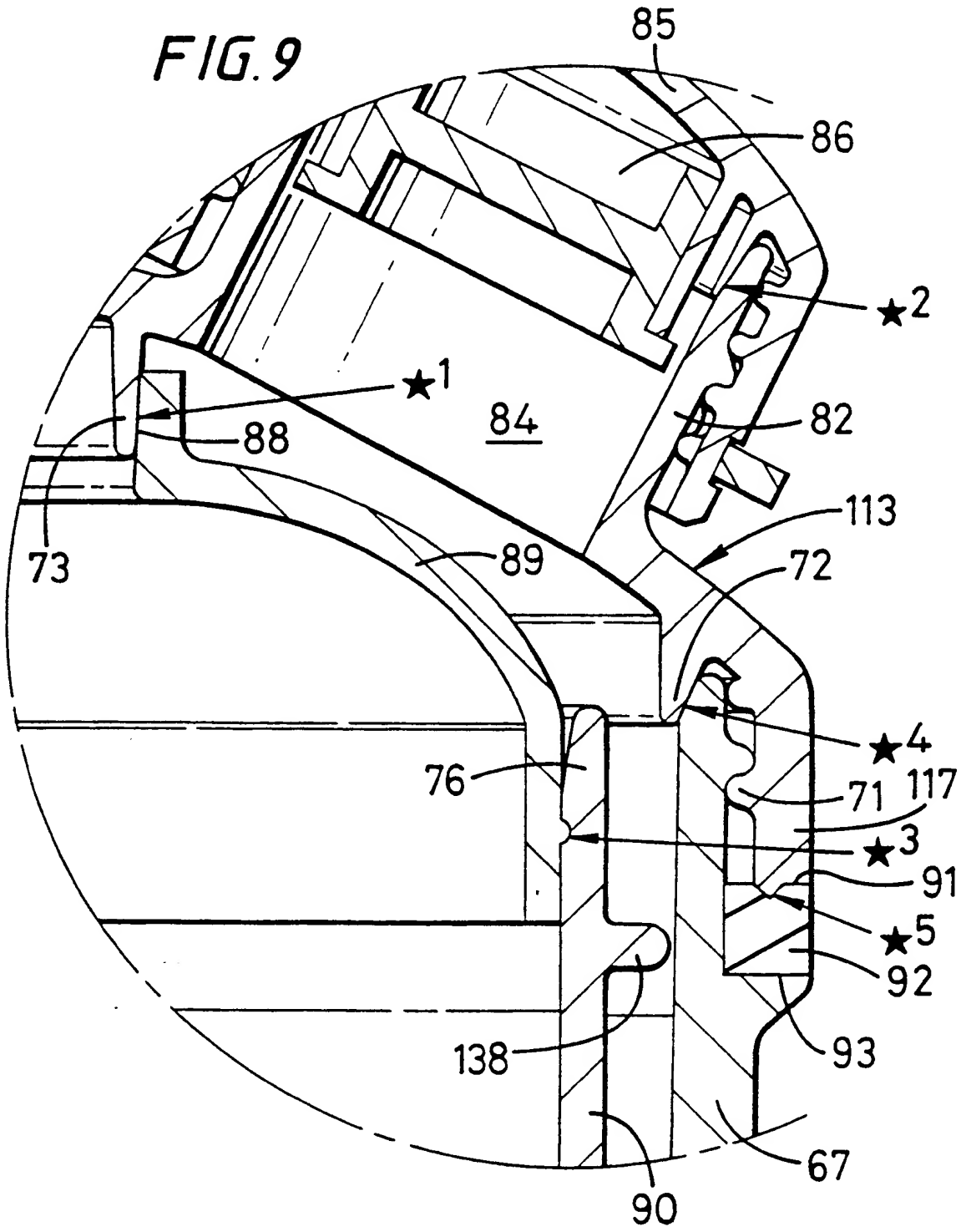
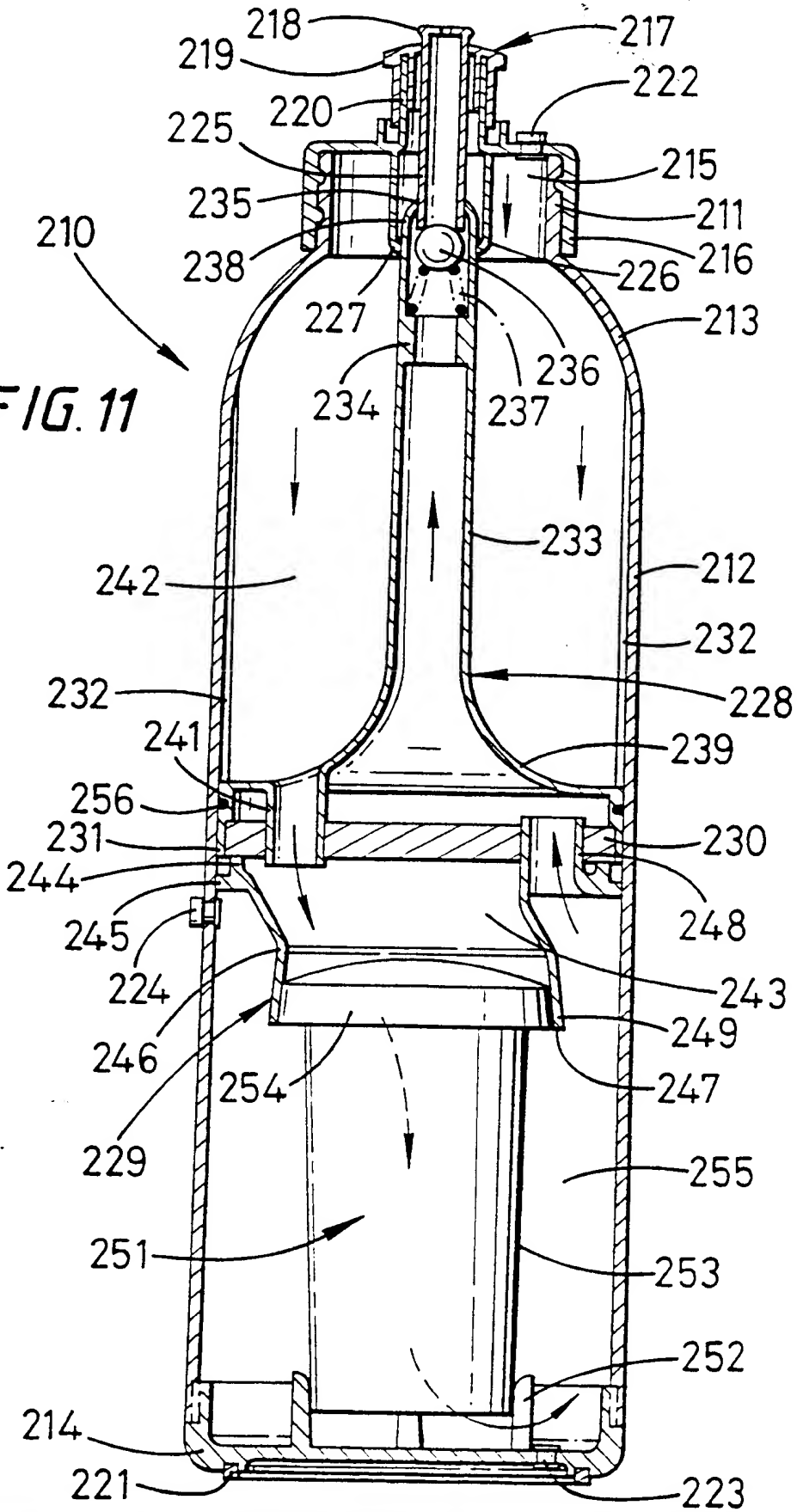


FIG. 11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INTERNATIONAL SEARCH REPORT

Intern. al Application No
PCT/GB 00/02960

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C02F1/00 B01D35/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C02F B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	EP 0 384 150 A (NIPPON OXYGEN CO LTD) 29 August 1990 (1990-08-29) figures 1,6,7	1
A	WO 96 38382 A (CRANSHAW CHRISTOPHER JAMES) 5 December 1996 (1996-12-05) figures	1
A	US 5 919 365 A (COLLETTE DANIEL) 6 July 1999 (1999-07-06) figures 1-3	1

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
1 November 2000	09/11/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Gruber, M

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 5 840 185 A (HUGHES DOUGLASS ET AL) 24 November 1998 (1998-11-24) figures 2-4	1
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A	WO 98 32705 A (BRITA WATER FILTER SYST LTD ;ROBINSON THOMAS (GB)) 30 July 1998 (1998-07-30) page 9, paragraph 2; figure 4	1-8
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